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the gun. As a result, the spray nozzle may have to be dis-assembled to enable the spray nozzle and internal passageways of the gun to be properly cleaned. This is time consuming and the use of solvents is undesirable from health and safety considerations and causes problems for disposal of the solvent after use.

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We have recently developed a system in which the reservoir is disposable after use thereby reducing the amount of cleaning required on completion of spraying. With this system, however, the spray gun including the spray nozzle must still be cleaned to remove all traces of the liquid before the gun is put away or before spraying another liquid.

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Summary of the Invention

The present invention has been made from a consideration of the foregoing problems and disadvantages of the existing delivery systems for spraying a liquid.

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More especially, embodiments of the present invention provide an improved liquid delivery system for use with a spray gun whereby cleaning of the spray gun on completion of spraying and/or when changing over the spray gun to spray a different liquid may be simplified.

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In particular, at least one embodiment of the present invention provides a liquid delivery system including a spray head in which the liquid is delivered to a spray nozzle from a reservoir connected to the spray head without passing through the spray gun body.

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Furthermore, at least one embodiment of the present invention provides a liquid delivery system in which the spray head is detachable from the spray gun and can be thrown away after use such that the amount of solvent used to clean the spray gun may be reduced.

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In addition, at least one embodiment of the present invention provides a liquid delivery system in which a reservoir for the liquid to be dispensed is mounted on the spray head and is detachable with the spray head from the spray gun.

5 Thus, according to one aspect of the present invention, there is provided liquid spraying apparatus comprising a spray gun including a body, a spray head including a body releasably connected to the spray gun body and further including a spray nozzle, and a liquid reservoir connected to the spray head body for supplying liquid to the spray nozzle.

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As used herein, the term "liquid" refers to all forms of flowable materials that can be applied to a surface using a spray gun (whether or not they are intended to colour the surface) including (without limitation) paints, primers, base coats, lacquers, varnishes and similar paint-like materials as well as other materials
15 such as adhesives, sealers, fillers, putties, powder coatings, blasting powders, abrasive slurries, mould release agents and foundry dressings which may be applied in atomised or non-atomised form depending on the properties and/or the intended application of the material and the term "liquid" is to be construed accordingly.

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By connecting the reservoir to the spray head and arranging for the spray head to be detachable from the spray gun, cleaning of the spray gun is simplified. As a result, a reduction in the amount of solvent used to clean the spray gun may be possible.

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More particularly, liquid withdrawn from the reservoir in use is delivered to the spray nozzle through the spray head body without passing through the spray gun body. In this way, the extent to which the spray gun body is contaminated by the liquid and the amount of cleaning required on completion of spraying or
30 when changing over the spray gun to spray another liquid may be reduced.

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Preferably, the spray head is disposable and can be thrown away after use. In this way, cleaning of the spray head can be avoided and the spray gun can be changed over to dispense another liquid by attaching a new spray head with a clean spray nozzle connected to a reservoir for the liquid.

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Advantageously, the spray head body and spray gun body are provided with mateable formations for releasably securing the spray head to the spray gun. For example, the mateable formations may form a bayonet type connection that facilitates rapid connection/disconnection of the spray head with a simple push twist action. Any other suitable type of mateable formations providing a releasable connection may be employed.

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The reservoir may be provided at a remote location and connected to the spray head by a flexible delivery line. Preferably, the delivery line includes a manually operable valve to close the delivery line when disconnected from the spray head.

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Alternatively, the reservoir may be mounted on the spray head. For example, the spray head body may be provided with an inlet connected to the reservoir. In one arrangement, the connection between the reservoir and the spray head is releasable such that the reservoir can be detached from the spray head, for example, a bayonet type connection. In this way, the reservoir may be reusable. More preferably the reservoir or at least the parts of the reservoir contaminated by contact with the liquid are disposable and can be discarded after use. In this way, contaminated parts may be thrown away and the spray gun re-used with a new spray head and reservoir. As a result, the amount of cleaning required on completion of spraying or when changing over the liquid to be sprayed is reduced.

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The reservoir may be collapsible as liquid is withdrawn in use and may be supplied empty for the end user to fill or pre-filled with liquid for connection to the spray head. Where the reservoir is pre-filled, an outlet for the liquid is

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provided with a closure to seal the reservoir until it is desired to fit the reservoir to the spray head.

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Preferably, the spray nozzle is adapted to atomise the liquid to form a spray.

5 For example, the spray nozzle may be arranged to mix the liquid emerging from the nozzle with a supply of compressed air.

10 In a preferred arrangement, the spray nozzle has a central hole for the liquid surrounded by a concentric annular opening for compressed air and a pair of opposed inwardly directed apertures for compressed air arranged on opposite sides and spaced forwardly of the central hole. In this way, the liquid emerging from the central hole is mixed with air streams emerging from the concentric annular opening and from the inwardly directed apertures to cause the liquid to atomise and form a fine spray for application to a substrate.

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The air streams from the inwardly directed apertures may be adjustable to adapt the spray nozzle for dispensing different liquids. For example, the inwardly directed apertures may be provided by a member mounted on the spray head body, and a set of interchangeable members may be provided for
20 releasable connection to the spray head body to change, for example, the atomisation parameters or spray pattern as desired.

For some applications, atomisation of the liquid may not be required and the air supply may then be omitted or disconnected. For example when dispensing
25 adhesives, sealers, putties, fillers etc.

Preferably, the spray gun includes a trigger mechanism to control dispensing of the liquid and, where required, the air supply to the spray nozzle for atomising the liquid. The trigger mechanism may actuate a member for opening/closing a
30 passageway through the spray head for controlling flow of the liquid to the spray head.

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For example, the member may comprise a needle member received in the passageway and operatively connected to the trigger mechanism so as to be moved from an advanced position closing the passageway to a retracted position opening the passageway when the trigger mechanism is actuated.

5 With this arrangement the needle may have to be wiped clean when the spray head is removed but this is a simple operation and may be effected without the use of solvents.

According to another aspect of the present invention, there is provided a spray head for attachment to a spray gun body, the spray head having a spray nozzle for dispensing liquid supplied to the spray head, wherein the spray head includes a body connectable to the spray gun body and is adapted for connection to a liquid reservoir such that liquid from the reservoir is delivered to the spray nozzle through the spray head body without passing through the spray gun body.

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Preferably, the spray head body is releasably connected to the spray gun body. In this way, the spray head can be detached and thrown away after use. As a result, the amount of cleaning required on completion of spraying and/or when

20 changing over the spray gun to spray another liquid may be reduced.

The spray head may be employed with spray guns of the gravity feed, pressure feed or suction feed type. Existing spray guns having an inlet for connection to a liquid reservoir may be converted for use with the spray head by closing the inlet, for example with a blanking plug. If required, an adaptor may be provided to connect the spray head body to the spray gun body.

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A reservoir for the liquid to be dispensed may be mounted on the spray head so as to be removable from the spray gun with the spray head. The reservoir may be releasably connected to the spray head and may be disposable or re-usable.

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Alternatively, the spray head and reservoir may be permanently joined together.

The spray head may be adapted for atomising the dispensed liquid. For example, the spray nozzle may be arranged to provide opposed inwardly directed air streams to mix with concentric streams of liquid and air emerging from the spray nozzle to atomise the liquid and create a spray. The atomisation parameters or spray pattern may be controlled by adjusting the inwardly directed air streams.

According to yet another aspect of the present invention, there is provided a liquid delivery system for a spray gun comprising a spray head including a body provided with a spray nozzle and adapted for releasable connection to a spray gun body and a reservoir for a liquid to be dispensed, the reservoir being connected to the spray head such that liquid withdrawn from the reservoir in use is delivered to the spray nozzle through the spray head body without passing through the spray gun body.

The spray head and reservoir could be "all-in-one".

Other features, benefits and advantages of the invention will be apparent from the following detailed description of exemplary embodiments of the invention with reference to the accompanying drawings.

Brief description of the drawings

Figure 1 is a side view of a prior art gravity feed spray gun showing the component parts of the spray nozzle detached from the body of the spray gun;

Figure 2 is a side view, partly sectioned, of the body of the spray gun shown in Figure 1;

Figure 3 is a side view of a gravity feed spray gun embodying the present invention;

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It will be appreciated that the exemplary embodiments described herein are intended to illustrate the diverse range and application of the invention and that features of the embodiments may be employed separately or in combination with any other features of the same or different embodiments.

Moreover, while the exemplary embodiments described and illustrated are believed to represent the best means currently known to the applicant, it will be understood that the invention is not limited thereto and that various modifications and improvements can be made within the spirit and scope of the invention as generally described herein.

For example, the needle employed to control dispense of the liquid from the spray nozzle may be omitted and replaced by any other suitable means for preventing escape of the liquid when the spray gun is not in use. Such means may be incorporated as part of the spray head and/or reservoir so as to be disposable therewith. In this way, it may be possible to eliminate completely any paint contaminated parts requiring cleaning when changing over the spray head.

Existing spray guns such as shown in Figures 1 and 2 may be converted for use with the spray head of the present invention. For example, the inlet in the spray gun body for connection to a paint reservoir could be closed, for example with a blanking plug, and an adaptor with bayonet lugs screwed onto the front end of the spray gun body for attaching the spray head. Alternatively, the socket of the spray head body could be provided with an internal screw thread to enable the spray head to be screwed on the spray gun body.

Other modifications and changes apparent to those skilled in the art are deemed within the scope of the invention as defined in the following claims.

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CLAIMS

1. Liquid spraying apparatus comprising a spray gun including a body, a spray head including a body releasably connected to the spray gun body and
5 further including a spray nozzle, and a liquid reservoir connected to the spray head body for supplying liquid to the spray nozzle.
2. Apparatus according to claim 1 wherein, the spray head body and spray gun body are provided with mateable formations for releasably securing the
10 spray head to the spray gun.
3. Apparatus according to claim 2 wherein, the mateable formations form a bayonet type connection.
- 15 4. Apparatus according to any one of the preceding claims wherein, the spray head is connectable to a remote reservoir.
5. Apparatus according to claim 4 wherein, a flexible delivery line is provided between the reservoir and the spray head.
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6. Apparatus according to claim 5 wherein, the delivery line includes a manually operable valve to close the delivery line when disconnected from the spray head.
- 25 7. Apparatus according to any one of claims 1 to 3 wherein, the reservoir is mounted on the spray head.
8. Apparatus according to claim 7 wherein, a releasable connection is provided between the reservoir and the spray head such that the reservoir can
30 be detached from the spray head

9. Apparatus according to claim 8 wherein, the connection is a bayonet type connection.

10. Apparatus according to any one of the preceding claims wherein, the reservoir is re-usable.

11. Apparatus according to any one of claims 1 to 10 wherein, the reservoir is disposable and can be discarded after use.

12. Apparatus according to any one of the preceding claims wherein, the reservoir is collapsible as liquid is withdrawn in use.

13. Apparatus according to any one of the preceding claims wherein, the reservoir is supplied empty for the end user to fill.

14. Apparatus according to any one of claims 1 to 12 wherein, the reservoir is supplied pre-filled and has an outlet provided with a closure to seal the reservoir until it is desired to fit the reservoir to the spray head.

15. Apparatus according to any one of the preceding claims wherein the spray head has a spray nozzle for dispensing the liquid to be sprayed.

16. Apparatus according to claim 15 wherein, the spray nozzle is adapted to atomise the liquid to form a spray.

17. Apparatus according to claim 16 wherein, the spray nozzle is arranged to mix the liquid emerging from the nozzle with a supply of compressed air.

18. Apparatus according to claim 17 wherein the spray nozzle provides a stream of compressed air concentric with the liquid emerging from the nozzle.

19. Apparatus according to claim 18 wherein, the spray nozzle provides a pair of inwardly directed air streams on opposite sides of the liquid emerging from the nozzle.

5 20. Apparatus according to claim 19 wherein, the inwardly directed air streams are provided by a pair of horns projecting forwardly of an outlet for the liquid emerging from the nozzle.

10 21. Apparatus according to claim 20 wherein, the horns are detachable for adapting the spray nozzle for dispensing different liquids.

15 22. Apparatus according to claim 21 wherein, a set of interchangeable horns is provided for releasable connection to the spray head to change the atomisation parameters or spray pattern.

23. Apparatus according to any one of the preceding claims wherein, the spray gun includes a trigger mechanism to control dispensing of the liquid.

20 24. Apparatus according to claim 23 wherein, the trigger mechanism includes a member for opening/closing a passageway for the liquid through the spray head.

25 25. Apparatus according to claim 24 wherein, the member comprises a needle operatively connected to the trigger mechanism so as to be retracted to open the passageway when the trigger mechanism is actuated.

30 26. A spray head for attachment to a spray gun body, the spray head having a spray nozzle for dispensing liquid supplied to the spray head, wherein the spray head includes a body connectable to the spray gun body and is adapted for connection to a liquid reservoir such that liquid from the reservoir is delivered to the spray nozzle through the spray head body without passing through the spray gun body.

27. A spray head according to claim 26 wherein, the spray head is employed with spray guns of the gravity feed, pressure feed or suction feed type.

5 28. A spray head according to claim 26 or claim 27 wherein, a reservoir for the liquid to be dispensed is mounted on the spray head so as to be removable from the spray gun with the spray head.

10 29. A spray head according to claim 28 wherein, the reservoir is releasably connected to the spray head.

30. A spray head according to any one of claims 26 to 29 wherein, the spray head is adapted for atomising the dispensed liquid.

15 31. A spray head according to claim 30 wherein, the spray head is arranged to provide an air stream concentric with the liquid.

20 32. A spray head according to claim 31 wherein the spray head is arranged to provide air streams directed inwardly into the dispensed liquid from opposite sides.

33. A spray head according to claim 32 wherein the spray characteristics are controlled by adjusting one or more of the air streams.

25 34. A spray head according to claim 32 or claim 33 wherein, the inwardly directed air streams emerge from a pair of horns arranged on opposite sides of a central hole for dispensing the liquid.

30 35. A spray head according to claim 34 wherein, the horns are detachable for selective fitment of different pairs of horns for altering the spray characteristics.

36. A liquid delivery system for a spray gun comprising a spray head including a body provided with a spray nozzle and adapted for releasable connection to a spray gun body and a reservoir for a liquid to be dispensed, the reservoir being connected to the spray head such that liquid withdrawn from the reservoir in use is delivered to the spray nozzle through the spray head body without passing through the spray gun body.

37. Liquid spraying apparatus substantially as hereinbefore described with reference to Figures 3 to 6 of the accompanying drawings.

38. Liquid spraying apparatus substantially as hereinbefore described with reference to Figures 3 to 6 of the accompanying drawings as modified by any of Figures 7 to 12 of the accompanying drawings.

39. A spray head for attachment to a spray gun substantially as hereinbefore described with reference to Figures 4 to 6 of the accompanying drawings

40. A spray head for attachment to a spray gun substantially as hereinbefore described with reference to Figures 4 to 6 of the accompanying drawings as modified by Figure 8 of the accompanying drawings.

41. A liquid delivery system for a spray gun substantially as hereinbefore described with reference to Figures 3 to 6 of the accompanying drawings.

42. A liquid delivery system for a spray gun substantially as hereinbefore described with reference to Figures 3 to 6 of the accompanying drawings as modified by any one of Figures 7 to 12 of the accompanying drawings.